The Egyptian National Nutrition Survey, 1978*

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The Egyptian National Nutrition Survey, conducted during January–April 1978, quantified the protein–energy and anaemia status of young children from urban and rural areas. The close correspondence between the distribution of weight-for-height measurements of children in the survey and reference children showed that the protein–energy intake of Egyptian children was adequate. The prevalence of chronic undernutrition (less than 90% of the height-for-age reference median) and of anaemia decreased with urbanization and was highest among children in the 12–47-months age range. Anaemia was more common among chronically undernourished children than among children of normal stature.

Between early January and mid-April 1978, the Nutrition Institute of the Egyptian Ministry of Health completed a survey assessment of the nutritional status of a representative sample of preschool children. The survey was conducted in cooperation with the United States Agency for International Development, UNICEF, and the Center for Disease Control (CDC), Atlanta, GA, USA. The primary objectives of the survey were to assess the nutritional status of Egyptian children aged 6–71 months and to compare the nutritional status of children both between rural and urban populations and in various rural regions of Egypt. Data on body measurements, haemoglobin values, and selected clinical signs were collected as indicators of nutritional status.

Nutritional status surveys in several populations of Egyptian children from 0 to 72 months of age using the indices of weight-for-age, height-for-age, and in one instance, weight-for-height, have been reported previously (*1–5*). Abdou et al. have suggested that the growth of the Egyptian child is equal to or even exceeds that of the Western reference child for the first few months of life, but begins to lag by 6 months of age (*1, 3*). At 1 year of age, Egyptian children show a marked deficit in both weight and height, which increases with age up to approximately 3 years. From 3 till 5 years of age, improvements in the weight-for-age

index occur while the degree of height-for-age deficit stabilizes. In one study which analysed weight-for-height, a low prevalence of wasting (defined as weight-for-height that was less than 80% of the reference median) occurred in the 6–24 months age group (*2*). Abdou's data suggested that, in 1968, rural children tended to be lighter and shorter than urban children and that female children tended to be lighter and shorter than male children.

Anaemia is a common health problem in all age groups in Egypt (*3, 6, 7*). The prevalence of anaemia (haemoglobin values less than 110 g/l) in some rural and urban-Cairo groups of children exceeded 90% (*3*). Abdou observed a higher prevalence of anaemia among the chronically undernourished (*6*).

METHODS

Egypt is divided into 25 geopolitical units known as governorates. Lower Egypt is composed of nine governorates (north of Cairo) and includes 43.4% of the population. Upper Egypt, composed of eight governorates (south of Cairo) contains 34.6% of the population. Four urban governates — Cairo, Alexandria, Port Said and Suez — contain 21.4% of the population. The four frontier governorates — Red Sea, New Valley, Metrouh and Sinai — contain only 0.6% of the total population.

For survey purposes, nine sampling universes were constructed from the 21 non-frontier governorates by using geopolitical and population criteria; the four frontier governorates were excluded because they have so few people. Six *rural universes* (two in Upper and four in Lower Egypt) were constructed from the

17 non-urban governorates. These rural universes were geographically defined by the boundaries of one or more governorates and consisted of the population of all villages with less than 10 000 residents within the defined boundaries. In addition, a *large village universe* was constructed from all villages in the 17 governorates with a population between 10 000 and 49 999, and a *small town universe* was constructed from all towns with a population of between 10 000 and 49 999.[a] The ninth universe, a *small city universe*, included all cities with a population of 50 000 or greater (except Cairo and Alexandria).

In addition to these nine sampling universes, two more universes were drawn from the disadvantaged sectors of Cairo–Giza and Alexandria. Disadvantaged sectors were defined as city districts in which more than 90% of the population had been classified as "uneducated" by the Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). Because neither of these two universes is representative of the general population of either Cairo–Giza or Alexandria, data for these universes are shown separately.

Finally, a special comparison group of 1883 children aged 6–71 months was identified through private nursery schools and socioeconomically advantaged families in Cairo. All the children in this group were weighed and measured. Haemoglobin determinations were made on 359 (19.7%) of them to provide estimates of the nutritional status potentially attainable by the preschool children of Egypt.

To permit inferences to be drawn for each of the first nine universes discussed in regard to the nutritional status of preschool children, 30 sample sites were selected in each universe by population-proportionate sampling using 1976 census data from CAPMAS. For each sample site, the first household to be surveyed was randomly selected from a list of households by a survey team. The next closest houses in a clockwise direction were used as the second and subsequent survey households. The survey team enrolled all children aged 6–71 months in each household in the survey until 30 children had been identified and surveyed at each site.

The survey team measured the length or stature of each survey child to the nearest 0.1 cm with a portable measuring board. Weight was measured to the nearest 0.1 kg using a hanging scale. The presence or absence of oedema on the feet was determined by firm thumb pressure for 3 seconds on the dorsal surface of both feet. In preparation for the survey, eight field teams were trained to use identical survey methods in order to standardize the accuracy and reproducibility of quantitative measurements and identification of clinical signs. Signs of vitamin A deficiency (including Bitot's spots and corneal scars) and of vitamin D deficiency (including craniotabes, frontal bossing, enlarged wrist, leg deformity, rachitic rosary or deformed chest) were looked for systematically.

Capillary blood was collected by finger prick from every fifth child in the survey. The haemoglobin content was determined within 36 hours by a technician using the cyanmethaemoglobin method and a Fisher[b] model haemophotometer.

Three indices of physical growth were used to describe the protein–energy nutritional status of Egyptian preschool children: weight-for-height, height-for-age, and weight-for-age. Weight-for-height, or body mass in relation to body length, provides an estimate of the adequacy of recent nutrient intake (8, 9). Height-for-age is an index of linear growth and reflects the adequacy of the long-term or past diet of the child (8, 9). The weight-for-age index is a composite index and cannot distinguish between a child who is underweight because of thinness and one who is underweight because of shortness (10, 11).

Data for all anthropometric indices are presented as percentages of the NCHS/CDC (National Center for Health Statistics/Centers for Disease Control) reference median values (12). Although these median values are comparable to the Stuart-Meredith reference values of height-for-age and weight-for-age (13), the NCHS/CDC data set includes a larger number of children, more representative sampling, direct calculation of weight-for-height, and a more complete statistical description that improves statistical precision in analysing anthropometric data.

Children with a weight-for-height less than 85% of the NCHS/CDC reference median are considered acutely undernourished. Children with a weight-for-height value greater than 120% of the NCHS/CDC reference median are considered overweight. Children with a height-for-age less than 90% of the NCHS/CDC reference median are considered chronically undernourished. Children with weight-for-age less than 75% of the NCHS/CDC reference median suffer from undernutrition, i.e., second- or third-degree malnutrition according to the Gomez classification (10).

To assess the extent of undernutrition in a population of children, Waterlow (11) has suggested three categories for a classification system: wasting, stunting, and concurrent wasting and stunting. Children exhibit wasting if they are below 80% of the weight-for-height reference median, but are over 90% of the height-for-age median. Similarly, they show stunting if they are below 90% of the height-for-age reference median, but exceed 80% of the weight-for-height

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median. Children below the cutoffs for both weight-for-height and height-for-age represent concurrent wasting and stunting, and are probably at greater risk of morbidity and mortality.

RESULTS

Data from 9794 preschool children (8016 in the total representative sample and 1778 in metropolitan Cairo–Giza and Alexandria) were analysed. Questionnaires on 106 additional children were excluded because of obvious errors in age or anthropometric data. The age and sex distribution of the total representative sample is shown in Table 1. The slight excess of male over female children shown in Table 1 was also evident in the findings for metropolitan Cairo–Giza and Alexandria.

The Waterlow classifications (11) of the nutritional status of Egyptian preschool children are shown in Table 2 for selected universes, aggregates of survey universes, and the special comparison group. The overall prevalence of wasting is low in all the areas studied. Stunting was identified in 20.8% of the representative sample children. The highest prevalences of stunting occurred in rural villages, small and large, particularly in Upper Egypt (27.0%). Linear growth improved, among the children studied, with increasing urbanization; in cities with a population greater than 50 000 (excluding Cairo and Alexandria), the prevalence of stunting was only 10.6%. The preva-

Table 1. Percentage distribution[a] of preschool children, by age and sex, for the total representative sample, Egypt, 1978

Age (Months)	Male (%)	Female (%)	Total percentage[b]	
6–11	5.3	4.8	10.1	(809)
12–23	11.5	11.0	22.5	(1816)
24–35	10.5	10.1	20.7	(1657)
36–47	10.1	7.5	17.6	(1422)
48–59	8.7	7.3	16.0	(1267)
60–71	6.9	6.3	13.2	(1045)
Total	52.9	47.1	100.0	(8016)

[a] All percentages are weighted by universe population proportions.

[b] The actual number of persons surveyed is given in parentheses.

lence of stunting was 15.7% and 18.8% in the disadvantaged areas of Alexandria and Cairo–Giza, respectively, and only 1.1% in the special comparison group. Concurrent wasting and stunting was noted in 0.3% of the representative sample.

Based on the weight-for-height percentages above and below the NCHS/CDC reference median, the prevalence of acute undernutrition and overnutrition by age group is presented in Table 3 for the total representative sample of Egyptian preschool children.

Table 2. Percentage distribution[a] of preschool children, by the Waterlow classification and survey universes, Egypt, 1978

Universes	Waterlow classification				Total percentage[b]	
	Wasting (%)	Stunting (%)	Wasting and stunting (%)	Normal (%)		
Lower Egypt rural villages	0.5	21.5	0.3	77.8	100.0	(3552)
Upper Egypt rural villages	0.2	27.0	0.6	72.2	100.0	(1784)
Large villages	—	24.0	0.3	75.7	100.0	(889)
Small towns	0.3	14.5	0.2	84.9	100.0	(894)
Small cities	0.3	10.6	—	89.1	100.0	(897)
Total representative sample	0.3	20.8	0.3	78.6	100.0	(8016)
Cairo – Giza (disadvantaged sector)	0.6	18.8	0.2	80.4	100.0	(890)
Alexandria (disadvantaged sector)	0.1	15.7	0.1	84.1	100.0	(888)
Special comparison group	0.1	1.1	—	98.8	100.0	(1883)

[a] Percentages are weighted by universe population proportions.

[b] The actual number of persons surveyed is given in parentheses.

Table 3. Percentage distribution[a] of preschool children, by weight-for-height classes and age, for the total representative sample, Egypt, 1978

| Age (months) | Percentage of weight-for-height reference median | | | | Total percentage[b] | |
| | Acute undernutrition | | Normal | Overweight | | |
	< 80.0%	80.0–84.9%	85.0–119.9%	≥ 120.0%		
6–11	1.5	3.8	91.5	3.1	100.0	(809)
12–23	1.2	3.8	94.0	1.0	100.0	(1816)
24–35	0.3	1.2	95.3	3.2	100.0	(1657)
36–47	0.2	0.4	93.3	6.1	100.0	(1422)
48–59	0.2	0.2	96.5	3.1	100.0	(1267)
60–71	0.2	0.4	97.2	2.2	100.0	(1045)
Overall	0.6	1.7	94.7	3.1	100.0	(8016)

[a] Percentages are weighted by universe population proportions.

[b] The actual number of persons is given in parentheses.

Children in the two age groups between 6 and 23 months had the highest prevalence of acute undernutrition, and children aged 36–47 months had the highest prevalence of overnutrition.

Based on the height-for-age percentages below the NCHS/CDC reference median, the prevalence of chronic undernutrition by age group for the total representative sample is presented in Table 4. The prevalence of chronic undernutrition was highest in the three age groups between 12 and 47 months (22.6–26.5%) and declined to approximately 16% in the two age groups between 48 and 71 months.

The distribution of the height-for-age and weight-for-height standard deviations for the special comparison group closely follows that for the NCHS/CDC reference population (Fig. 1 and 2); the height-for-age curve for the representative sample, however, is well to the left of the reference curve (Fig. 1).

In terms of the Gomez classification by weight-for-age (Table 5), the prevalences of severe malnutrition (i.e., the combined second- and third-degree classes of malnutrition) declined with urbanization from a high of 12.9% in small villages in Upper Egypt to

Table 4. Percentage distribution[a] of preschool children, by height-for-age classes and age, for total representative sample, Egypt, 1978

| Age (months) | Percentage of height-for-age reference median | | | | Total percentage[b] | |
| | Chronic undernutrition | | Normal | | | |
	< 85.0%	85.0–89.9%	90.0–94.9%	≥ 95.0%		
6–11	2.2	8.0	33.2	56.6	100.0	(809)
12–23	5.7	20.5	39.4	34.4	100.0	(1816)
24–35	6.1	20.4	40.0	33.4	100.0	(1657)
36–47	5.6	17.0	40.2	37.2	100.0	(1422)
48–59	3.5	12.8	43.0	40.8	100.0	(1267)
60–71	1.0	15.0	45.1	38.9	100.0	(1045)
Overall	4.5	16.7	40.4	38.5	100.0	(8016)

[a] Percentages are weighted by universe population proportions.

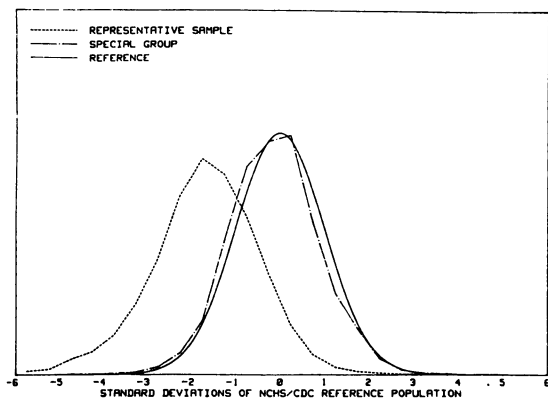[b] The actual number of persons is given in parentheses.

Fig. 1. Comparison of height-for-age standard deviations: curves for the representative sample and the special group in Egypt, 1978, and for the NCHS/CDC reference population.
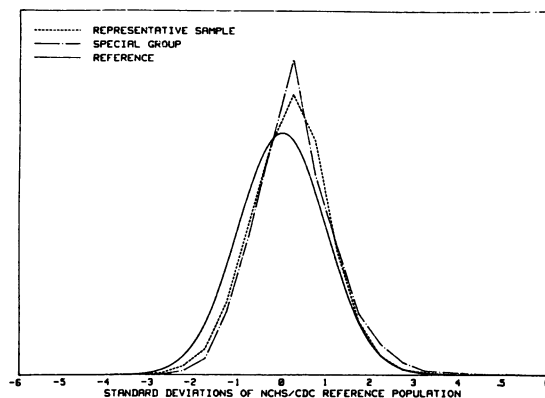
Fig. 2. Comparison of weight-for-height standard deviations: curves for the representative sample and the special group in Egypt, 1978, and for the NCHS/CDC reference population.

Table 5. Percentage distribution[a] of preschool children, by the Gomez weight-for-age classification and geographical area, Egypt, 1978

Geographical area	Degree of undernutrition[b]				Total percentage[c]	
	Third degree	Second degree	First degree	Normal		
	< 60.0%	60.0–74.9%	75.0–89.9%	≥ 90.0%		
Lower Egypt rural villages	0.6	7.8	37.4	54.2	100.0	(3552)
Upper Egypt rural villages	1.0	11.9	41.9	45.2	100.0	(1784)
Large villages	1.2	8.5	42.4	47.8	100.0	(889)
Small towns	0.7	6.0	35.5	57.8	100.0	(894)
Small cities	0.2	3.6	32.6	63.7	100.0	(897)
Total representative sample	0.8	8.0	38.5	52.7	100.0	(8016)
Cairo – Giza (disadvantaged sector)	0.7	8.4	41.7	49.2	100.0	(890)
Alexandria (disadvantaged sector)	0.5	4.3	38.3	57.0	100.0	(888)
Special comparison group	—	0.5	14.0	85.6	100.0	(1883)

[a] All percentages are weighted by universe population proportions.

[b] Percentage of reference median weight-for-age.

[c] The actual number of persons surveyed is given in parentheses.

3.8% in the small cities. Among children in the disadvantaged areas of Alexandria and Cairo–Giza, the prevalences were 4.8% and 9.1%, respectively. By age group, the prevalence rose from 10.9% in the 6–11 month age group to 18.5% in children 12–23 months old, and then declined to a range of 3.5–4.5% in the three age groups between 36 and 71 months.

Table 6 presents the distribution of haemoglobin values by sample area. These values in the representative samples tend to increase with urbanization. Anaemia is defined for purposes of this survey as a haemoglobin value of less than 100 g/l in children under 24 months of age and less than 110 g/l for older preschool children (14). For the representative

Table 6. Percentage distribution[a] of preschool children by haemoglobin values and survey universes, Egypt, 1978

Universes	Haemoglobin value (g/100 ml)					Total percentage	
	< 9.0	9.0–9.9	10.0–10.9	11.0–11.9	> 11.9		
Lower Egypt rural villages	9	12	23	29	26	100.0	(715)[b]
Upper Egypt rural villages	9	15	20	21	35	100.0	(358)
Large villages	8	10	22	22	39	100.0	(176)
Small towns	4	9	17	28	42	100.0	(180)
Small cities	1	4	18	31	46	100.0	(180)
Total representative sample	7	11	21	26	35	100.0	(1609)[a]
Cairo — Giza (disadvantaged sector)	3	9	23	34	31	100.0	(177)
Alexandria (disadvantaged sector)	5	17	20	30	28	100.0	(178)
Special comparison group	—	3	14	32	51	100.0	(359)

[a] Percentages are weighted by universe population proportions.

[b] The actual number of persons surveyed is given in parentheses.

sample, the prevalence of anaemia was highest in the three age groups between 12 and 47 months (Table 7). The prevalence of anaemia was considerably lower in the special group, for those aged 6–11 months, when compared with the sample population.

Table 8 shows that the prevalence of anaemia was significantly greater among stunted children than among children of normal height-for-age ($P = < 0.001$).

Of the 9794 children surveyed, 17 (0.2%) had oedema in both feet. More than one clinical sign of vitamin D deficiency was found in 1.4% of children, with the highest prevalence (2.4%) in the 12–35-month age group. Bitot's spots were found in only 4 children, and corneal scars in 16. A history of night blindness was recorded for 27 (0.4%) of 6354 children aged 24 months or older.

DISCUSSION

The Egyptian National Nutrition Survey, which was a cross-sectional study of children aged 6–71

Table 7. Percentage of anaemia[a] by age group for the total representative sample and the special comparison group, Egypt, 1978

Age (months)	Percentage[b] with anaemia (No. examined)			
	Total representative sample[c]		Special group[c]	
6–11	22	(169)	21	(14)
12–23	30	(383)	12	(33)
24–35	41	(338)	29	(79)
36–47	32	(270)	10	(92)
48–59	17	(234)	10	(72)
60–71	13	(215)	7	(69)
Overall	28	(1609)	14	(359)

[a] Anaemia defined as haemoglobin value less than 100 g/l for children aged 6–23 months and less than 110 g/l for children aged 24–71 months.

[b] All percentages are weighted by universe population proportions.

[c] Total number of children for whom haemoglobin values were available is given in parentheses.

Table 8. Prevalence of anaemia[a] among preschool children by height-for-age category for the total representative sample, Egypt, 1978

Assessment by height-for-age	Percentage with anaemia	Percentage without anaemia	Percentage total[c]	
Stunted[b]	45	55	100	(356)
Normal	23	77	100	(1253)

[a] Anaemia defined as haemoglobin value less than 100 g/l for children aged 6–23 months and less than 110 g/l for children aged 24–71 months.

[b] Height-for-age less than 90% of reference median.

[c] Percentages are weighted by universe population proportions. The actual number of children for whom haemoglobin values were available is given in parentheses.

months in well-defined rural and urban populations, was conducted between early January and mid-April 1978, when infant mortality rates and the prevalences of diarrhoeal illness and measles were at their lowest. The survey content and methods provided objective, representative information on the magnitude, distribution and location of the problems of protein–energy malnutrition and anaemia in Egyptian preschool children (15). Nutrition surveys utilizing this methodology have been done in several countries (16-19).

The general adequacy of the protein–energy intake among Egyptian preschool children in the winter of 1978 is indicated by the close correspondence in the distribution of weight-for-height measurements of the surveyed children with that of the NCHS/CDC reference group. Acute undernutrition, where found, occurred predominantly in children 6-23 months of age, a period of infancy associated with the changeover from breast milk to other food sources.

Chronic undernutrition (stunting) and anaemia were major problems among preschool children in Egypt in 1978. The magnitude of both problems, which were most common among children aged 12-47 months, decreased with urbanization. Survey results suggest that the inadequacy of calories, proteins and absorbable iron in the diet increases as children undergo weaning and continues while the children are essentially dependent upon another person to feed them. With increasing age and motor development, children are able to feed themselves and more successfully compete for food, with resultant improvements in linear growth and haemoglobin status. The finding of a higher prevalence of anaemia among chronically undernourished children compared with children of normal stature is further evidence that, in Egypt, a diet inadequate over the long-term in protein and calories is also inadequate in absorbable iron content.

The protein–energy nutritional levels of a special group of socioeconomically advantaged preschool children, both in the short and long term, were consistent with the distribution of the NCHS/CDC reference population, suggesting that ethnic background had little effect on the attainable stature of preschool children in Egypt (20). The distribution of stature shown by children in the special comparison group should therefore be attainable by all preschool children in Egypt.

Improvement or deterioration in the nutritional status of individuals, over a short or long term, is the result of changes in a complicated interplay of several man-made and natural factors affecting national and local land use, crop selection, food costs, consumption patterns and disease prevalences. Many of these factors can be actively monitored, seasonal variations and trends identified, and associations with nutritional status studied, which could lead to the establishment of remedial programmes for children in those age groups and geographical areas that have the highest risks. The effectiveness of this programme can be evaluated by ongoing anthropometric surveillance.

RÉSUMÉ

L'ENQUÊTE NATIONALE ÉGYPTIENNE DE 1978 SUR LA NUTRITION

L'enquête nationale égyptienne de 1978 sur la nutrition est une enquête transversale portant sur un échantillon représentatif des enfants d'âge préscolaire — 6 à 71 mois — de populations rurales et urbaines bien déterminées en Egypte. Elle a été menée entre le début janvier et la mi-avril, époque où les taux de mortalité infantile et la prévalence des maladies diarrhéiques et de la rougeole sont généralement les plus faibles. Le contenu de l'enquête et les méthodes appliquées ont fourni des renseignements représentatifs et objectifs sur l'ampleur, la distribution et l'implantation des problèmes de la malnutrition protéino-énergétique et de l'anémie chez les enfants égyptiens d'âge préscolaire.[15] D'autres enquêtes nutritionnelles appliquant cette méthodologie simplifiée mise au point par les Centers for Disease Control (CDC) ont été effectuées dans plusieurs pays.[16,17,18,19]

L'adéquation générale de l'apport protéino-énergétique chez les enfants égyptiens d'âge préscolaire au cours de l'hiver de 1978 est mise en évidence par l'étroite correspondance entre la distribution du poids pour l'âge des enfants examinés et celle du groupe de référence du NCH/CDC. Des cas de dénutrition aiguë ont été surtout observés chez des enfants de 6 à 23 mois, période de la petite enfance associée au passage du lait maternel à d'autres aliments.

La dénutrition chronique (hypotrophie) et l'anémie étaient des problèmes majeurs chez les enfants d'âge préscolaire en Egypte en 1978. L'ampleur des deux problèmes diminuait avec l'urbanisation. La dénutrition chronique et l'anémie étaient surtout fréquentes chez les enfants de 12 à 47 mois. Les constatations de l'enquête suggèrent que l'inadéquation de la teneur du régime alimentaire en calories, en protéines et en fer absorbable augmente à mesure que les enfants sont sevrés et se poursuit tant que les enfants dépendent essentiellement d'une autre personne pour les nourrir. Avec l'âge et le développement moteur qui s'ensuit, les enfants sont capables de manger seuls et sont davantage à même de disputer leur part aux autres membres de la famille, d'où une amélioration de la

croissance linéaire et du taux d'hémoglobine. L'enquête a également montré que l'anémie était plus fréquente chez les enfants chroniquement dénutris que chez les enfants de stature normale, ce qui confirme encore qu'en Egypte une alimentation deficitaire à long terme en protéines et en calories est également déficitaire en fer absorbable.

L'étude d'un groupe spécial d'enfants d'âge préscolaire appartenant à des couches socio-économiques favorisées dans la région du Caire a mis en évidence des niveaux nutritionnels protéino-énergétiques à court terme et à long terme compatibles avec la distribution de la population de référence du NCHS/CDC, ce qui suggère que les facteurs ethniques ont peu d'effet sur la stature que peuvent atteindre les enfants d'âge préscolaire en Egypte.[20] La distribution de la stature chez les enfants du groupe de comparaison spécial doit être considérée comme pouvant être atteinte par les enfants d'âge préscolaire dans toute l'Egypte.

L'amélioration ou l'aggravation de l'état nutritionnel à court terme et à long terme résulte de modifications dans l'interaction compliquée d'une foule de facteurs artificiels et naturels qui influent sur l'utilisation des sols à l'échelon national et local, sur le choix des cultures, le coût des denrées alimentaires, les modes de consommation et la prévalence des maladies. La quantification de ces facteurs n'entrait pas dans le cadre de l'enquête, mais il semble que plusieurs d'entre eux pourraient faire l'objet d'une surveillance active qui permettrait d'identifier les variations saisonnières et les tendances et d'établir leurs liens avec l'état nutritionnel. On pourrait se fonder sur ces associations pour suggérer des programmes d'action destinés aux enfants des groupes d'âge et des zones géographiques qui présentent les risques les plus élevés. L'efficacité des ces programmes pourrait ensuite être évaluée en recourant à la surveillance anthropométrique continue.

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